Construction and analysis of the cell surface's protein network for human sperm egg interaction

Abstract:

Sperm-egg interaction is one of the most impressive processes in sexual reproduction, and understanding the molecular mechanism is crucial in solving problems in infertility and failed in vitro fertilization. The main purpose of this study is to map the sperm-egg interaction network between cell-surface proteins and perform an interaction analysis on this new network. We built the first protein interaction network of human sperm-egg binding and fusion proteins that consists of 84 protein nodes and 112 interactions. The gene ontology analysis identified a number of functional clusters that may be involved in the sperm-egg interaction. These include G-protein coupled receptor protein signaling pathway, cellular membrane fusion, and single fertilization. The PPI network showed a highly interconnected network and identified a set of candidate proteins: ADAM-ZP3, ZP3-CLGN, IZUMO1-CD9, and ADAM2-IZUMO1 that may have an important role in sperm-egg interaction. The result showed that the ADAM2 may mediate interaction between two essential factors CD9 and IZUMO1. The KEGG analysis showed 12 statistically significant pathways with 10 proteins associated with cancer, suggesting a common pathway between tumor fusion and sperm-egg fusion. We believe that the availability of this map will assist future researches in the fertilization mechanism and will also facilitate biological interpretation of sperm-egg interaction.